High Efficiency Troffer Specification (2'x2', 2'x4', and 1'x4') V.3 – Draft for Comment

A Commercial Building Energy Alliances (CBEA) Project
Version 3.0

A. General Description: 1'x4', 2' x2' or 2'x4' Troffer

B. Application
- Ceiling application
  - Ceiling types
    - G – Grid
    - T – Screw Slot
    - Z – Z Spline/Modular
    - F-Flange
    - Plaster Frame Kit
- Mounting
  - Recessed
  - Surface-mounted

C. Construction/Finish
- Dimensions
  - Nominal Dimensions:
    - 1x4 - Length = 12", Width = 48"
    - 2x2 - Length = 24", Width = 24"
    - 2x4 - Length = 24", Width = 48"
  - Maximum height (depth) = 5"
- No visible welding, screws, latches, springs, hooks, rivets or plastic supports
- Static/air handling capability
- Earthquake Clips (optional)
- NYC code (optional)
- Chicago Code (optional)

D. Electrical
- Operating Voltage: 120 V at 60 Hz, 277 V at 60Hz, or universal voltage (120 V, 220/240 V, 277 V at 50/60 Hz)
- Total Harmonic Distortion (THD): ≤ 20%
- Power Factor (PF): ≥ 0.90
- Dimming: Continuous, flicker-free dimming from 100% to a minimum of 10%
  - Manufactures shall provide listing of compatible dimmers that have been tested and approved for use with their products
- Surge Protection: ANSI C62.41 Category A surge protection standards up to and including 4 kV
- Sound: Class A
- Replaceable Power Supply/Driver/Ballast
  LED Power Supply/Driver

- Driver Efficiency: Driver shall be ≥ 85% efficient at full load
- FCC Compliance FCC Part 15 Non-Consumer requirements for EMI/RFI emissions

Fluorescent Ballast

- Lamp Current Crest Factor: less than 1.7
- FCC Compliance: FCC Part 18 Non-Consumer requirements for EMI/RFI emissions
- End-of-lamp-life protection circuitry

E. Accessibility for Maintenance
- LED arrays, boards or engines shall be field replaceable without the use of a soldering gun

F. Photometric Performance
- Minimum initial lumens [Initial LED Luminaire light output is higher to account for the higher lumen maintenance of fluorescent lamps at rated life]

  LEDs Luminaires
  - 1x4 - 2100 initial lumens
  - 2x2 - 3200 initial lumens
  - 2x4 - 4200 initial lumens

  Fluorescent Luminaires
  - 1x4 - 2,000 initial lumens
  - 2x2 - 3,000 initial lumens
  - 2x4 - 4,000 initial lumens
- Minimum luminaire efficacy
  - 1x4 - 74 lm/W
  - 2x2 - 69 lm/W {Difference lies in the slightly lower fixture efficiency found in 2x2's}
  - 2x4 - 74 lm/W
- Spacing Criteria (SC). Spacing criteria is the ratio of center-to-center fixture spacing to mounting height (ceiling-to-workplane).

	0°-180° Plane	90°-270° Plane
1x4	1.15 -1.25	1.25 – 1.7
2x2		1.2 – 1.6
2x4		1.25 - 1.7

G. Chromaticity
- CCT: Only allowed CCTs are 2700K, 3000K, 3500K, 4000K and 5000K

  LEDs
  - Acceptable tolerances as provided in ANSI C78.377-2008.
  - Color Rendering Index: CRI (R_a) ≥ 80 with a positive R_9 value.
  - Tested per LM-79-2008

  Fluorescent Lamps
  - Acceptable tolerances as provided in ANSI C78.376-2001
  - NEMA Designated lamp (T5, T8, Biax, etc.)
  - Color Rendering Index: CRI (R_a) ≥ 80

H. Lumen Maintenance/Rated Life

LEDs
- ≥ 77.4% @ 36,000 hours = (≥ 70% @ 50,000 hours)

- Determined by IESNA LM-80 Data [parameters (drive current and steady-state temperature) determined by the In-situ Temperature Measurement Test (ISTMT)] then applying IESNA TM-21 procedure evaluated @ 36,000 hours.
- The requirement may also be met by IESNA LM-80 data intersection of the exponential decay function $L_{70} = L_{100}e^{-\lambda t}$, where L = Luminance; λ is a constant; t = time = 35,000 hours. Based upon LM-80 data and In-situ Temperature Measurement Test (ISTMT), evaluated @ 6000 hours with minimum lumen maintenance of 94.1%.

Fluorescent Lamps

- Minimum rated life of 30,000 hours. (Based upon programmed rapid start ballast with a 12-hour operating cycle.)

I. Standards

LEDs

- IESNA LM-79-2008
- IESNA LM-80-2008
- IESNA TM-21-2011
- ANSI C78.377-2009

Fluorescent

- IESNA LM-9-2009
- IESNA LM-41-1998
- ANSI C78.376-2001

J. Options

- Emergency lighting
  - Emergency Battery Pack (nominal 10% of initial light output)
  - Emergency Battery Pack (nominal 50% of initial light output)
- Dimming
  - Analog 0-10v dimming
  - Step dimming to 50%
  - Continuous, flicker-free dimming from 100% to 20%
  - Continuous, flicker-free dimming from 100% to 5%
  - Open digital dimming protocols, both wires (e.g. DALI or DMX/RDM) and wireless (e.g. ZigBee)
- Daylight sensing
- Load shedding/demand response
- Centralized Power Conversion/Controls
  - System shall have centralized power conversion from high voltage AC to low voltage DC.
  - Capable of powering a minimum of 4 luminaires
  - Idle Power Consumption: <10W
  - Contains ambient temperature sensor
  - Contains infrared (IR) sensor for motion detection
  - Contains fixture current and voltage sensor for integrated power metering
  - Field-upgradeable for new fixture types or future sensor package upgrades and modifications